What is claimed is:

1. A method of monitoring quality of service in communications over a packet-based network between two points, at least one of which is an endpoint, comprising the steps of:

transmitting test packets across the network and monitoring transmission characteristics of said test packets;

dynamically calculating from said transmission characteristics a measure of network performance; and

providing at said endpoint a dynamic indication of the network performance based on said calculation.

2. A method according to claim 1, wherein said transmission characteristics are selected from packet loss, transmission delay, and a combination thereof.

3. A method according to claim 2, wherein said transmission characteristics include both packet loss and transmission delay.

4. A method according to claim 1, wherein the indication of the network performance is provided by means of a visual display associated with the endpoint.

5. A method according to claim 1, wherein the indication of the network performance is provided by means of an aural signal provided to the endpoint.

6. A method according to claim 5, wherein the aural indication of the network performance is provided as a

discrete signal emitted at the endpoint when the value
of the metric passes a predetermined point.

7.   A method according to claim 1, wherein said test
packets include a first series of test packets which
5   issue from a source location to a destination location
and a second series of test packets which issue from
said destination location to said source location in
response to said first series of test packets, whereby
said network characteristics may be monitored by
10   comparing the first and second series of test packets.

8.   A method according to claim 7, wherein the first
series of test packets include local source timestamp
information and wherein the second series of test
packets include local destination timestamp
15   information, the difference between said local source
timestamp information and local destination timestamp
information being used to calculate a delay
characteristic of the network.

9.   A method according to claim 8, wherein the delay
20   characteristic is the absolute delay in echo-free
connections (Ta) between the source and destination
locations over the network.

10.   A method according to claim 7, wherein a measure
of packet loss is obtained by comparing the packets
25   issued from the source location and the packets
received back at the source location.

11.   A method according to claim 9, wherein a measure
of packet loss is obtained by comparing the packets

issued from the source location and the packets received back at the source location.

12.   A method according to claim 11, wherein the measure of packet loss and the identity of the communications codec being employed by the endpoint are used to calculate an equipment impairment factor (Ie).

13.   A method according to claim 12, wherein the calculation of Ie is made by looking up the measured packet loss in a stored table which correlates values of Ie with packet loss values for the codec being used.

14.   A method according to claim 11, wherein the calculated value of Ta is used to calculate a delay impairment factor.

15.   A method according to claim 14, wherein the delay impairment factor (Idd) is given by the formulae:

(i)   for Ta < 100ms,
       Idd = 0; and

(ii) for Ta => 100 ms,
     $Idd = 25 * ((1+X^6)^{1/6} - 3 * (1 + (X/3)^6)^{1/6} + 2)$

     Where $X = (\log(Ta/100))/\log(2)$

16.   A method according to claim 15, wherein a transmission rating factor R is calculated from the formula R = Y - Idd - Ie, where Y is a constant which

has been predetermined for the network and the
equipment being used on the network, and wherein Ie is
an equipment impairment factor calculated from the
measure of packet loss and the identity of the

5   communications codec being employed by the endpoint.

17.   A method according to claim 16, wherein the
calculation of Ie is made by looking up the measured
packet loss in a stored table which correlates values
of Ie with packet loss values for the codec being used.

10   18.   A method according to claim 17, wherein the value
of Y is from about 92 to about 97.

19.   A method according to claim 18, wherein the value
of Y is from about 93 to about 95.

20.   A method according to claim 19, wherein the value
15   of Y is about 94.5.

21.   A method according to claim 16, wherein the
calculated value of R is correlated to a subjective
metric for the quality of service, and wherein an
indication of the value of said subjective metric is
20   provided at the endpoint to a user.

22.   A method according to claim 21, wherein said
metric is a mean opinion score (MOS) and is calculated
according to the formula:

$$MOS = 1 + 0.035R + R(R-60)(100-R)(7 \times 10^{-6})$$

25   23.   A method according to claim 22, wherein said MOS
is further adjusted before being provided as an

indication at the endpoint, by normalising acceptable values of MOS to a different scale.

24.   A method according to claim 21, wherein the indication of the value of the subjective metric is provided by means of a visual display associated with the endpoint.

25.   A method according to claim 21, wherein the indication of the value of the subjective metric is provided by means of an aural signal provided to the endpoint.

26.   A method according to claim 25, wherein the aural indication is provided as a discrete signal emitted at the endpoint when the value of the metric passes a predetermined point.

27.   A method according to claim 1, wherein the step of providing a dynamic indication of the network performance includes providing, at the request of a user, an indication of one or more of said transmission characteristics.

28.   A method according to claim 27, wherein the request of the user is made by means of an input device associated with the endpoint and the indication is provided by means of a display device associated with the endpoint.

29.   A method according to claim 1, further comprising the step of logging the network transmission characteristics.

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30.   A method according to claim 1, further comprising the step of logging the results of said calculation.

31.   A method according to claim 30, wherein the step of logging the results of said calculation occurs only
5   when said results are within a predetermined range.

32.   A method according to claim 30, wherein the step of logging also includes logging the fact that a communications connection over the network has been lost.

10   33.   A method according to claim 1, further comprising the step of adjusting a billing record for a user in dependence on the results of said calculation.

34.   A computer program product in machine readable form containing instructions which when executed cause
15   a computer associated with an endpoint connected to a packet-based network to:
        monitor transmission characteristics of test packets transmitted across the network;
        dynamically calculate from said transmission
20   characteristics a measure of network performance; and
        provide to said endpoint a dynamic indication of the network performance based on said calculation.

35.   A computer program product according to claim 34, wherein said transmission characteristics are selected
25   from packet loss, transmission delay, and a combination thereof.

36. A computer program product according to claim 35, wherein the transmission characteristics include the absolute delay in echo-free connections (Ta) between source and destination locations over the network, obtained by comparing local timestamp information from source and destination locations on the network and a measure of packet loss obtained by comparing the packets issued from the source location and the packets received back at the source location.

37. A computer program product according to claim 36, wherein the measure of packet loss and the identity of the communications codec being employed by the endpoint are used to calculate an equipment impairment factor (Ie).

38. A computer program product according to claim 37, wherein a delay impairment factor (Idd) is given by the formulae:

(i)   for Ta < 100ms,
        Idd = 0; and

(ii) for Ta => 100 ms,
        $Idd = 25*((1+X^6)^{1/6} - 3*(1+(X/3)^6)^{1/6} + 2)$

        Where $X = (\log(Ta/100))/\log(2)$

39. A computer program product according to claim 38, wherein a transmission rating factor R is calculated from the formula R = Y - Idd - Ie, where Y is a constant which has been predetermined for the network and the equipment being used on the network, and

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wherein Ie is an equipment impairment factor calculated from the measure of packet loss and the identity of the communications codec being employed by the endpoint.

40.   A computer program product according to claim 39, wherein the value of Y is from about 92 to about 97.

41.   A computer program product according to claim 40, wherein the value of Y is from about 93 to about 95.

42.   A computer program product according to claim 41, wherein the value of Y is about 94.5.

43.   A computer program product according to claim 39, wherein the calculated value of R is correlated to a subjective metric for the quality of service, and wherein an indication of the value of said subjective metric is provided at the endpoint to a user.

44.   A computer program product according to claim 34, wherein provision of a dynamic indication of the network performance includes providing, at the request of a user, an indication of one or more of said transmission characteristics.

45.   A computer program product according to claim 34, further comprising instructions which when executed cause a computer to log the network transmission characteristics.

46.   A computer program product according to claim 34, further comprising instructions which when executed

cause a computer to log the results of said
calculation.

47.   A computer program product according to claim 34,
further comprising instructions which when executed

5   cause a computer to adjust a billing record for the a
in dependence on the results of said calculation.

48.   A telephone handset for connection to a packet-
based network, having a display device for displaying a
dynamic indication of network performance based on the

10   transmission characteristics of test packets
transmitted across a network to which the handset is
attached.

49.   A telephone handset according to claim 48,
further comprising a processor for calculating a

15   measure of network performance based on the
transmission characteristics of test packets
transmitted by the handset across the network.

50.   A system for monitoring quality of service in
communications over a packet-based network, comprising:

20   a source endpoint connected to the network via
which a user may transmit communication signals over
the network;
a test packet generator for transmitting test
packets across the network

25   a test packet receiver for receiving test packets
from the network;
a processor for measuring transmission
characteristics of said test packets and for
calculating from said transmission characteristics a

measure of network performance; and

an output device associated with said endpoint
for providing a dynamic indication of the network
performance based on said calculation.

5   51.   A system according to claim 50, wherein said test
packet generator includes a timestamp generator for
adding a local source timestamp to said test packets.

52.   A system according to claim 51, further
comprising a destination endpoint with which said
10   source endpoint is in communication over the network,
said destination endpoint having associated therewith:
a test packet receiver for receiving test packets from
the network; a timestamp generator for adding a local
destination timestamp to said received test packets;
15   and a test packet re-transmitter for re-transmitting
said received test packets with said local destination
timestamp back to their source.

53.   A system according to claim 52, further
comprising a centralised time server in communication
20   with the network for generating a standardised time and
providing same to said source and destination
endpoints.